Seminar über Physik der Kondensierten Materie

(WA KOMET, SFB TR6)

JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Room: Medienraum

Time: 14:00 st.

09.07.2013

Prof. Dr. Koki Takanashi

(Tohoku University)

Advanced spintronic materials: for generation and control of spin current

"Spin current", i.e., the flow of spin angular momentum, in magnetic nanostructures has emerged as a fascinating physical concept during the recent development of spintronics. In magnetic nanostructures, magnetism correlates strongly with electronic transport and also other physical properties, leading to the mutual control of magnetic, transport, and other physical properties. Spin current is the most basic concept relevant to the mutual control, and efficient generation and precise control of spin current in magnetic nanostructures are key technologies for the further development of spintronics[1].
Spin current is classified into two kinds: one is accompanied with electric current, and the other is not accompanied with electric current. Spin current without electric current is called pure spin current, which is actually generated by several experimental methods such as non-local spin injection, spin Hall effect, spin pumping, spin Seebeck effect, and so on. For recent years spin current has been extensively investigated, and particularly the understanding of pure spin current has dramatically developed.
In my lecture, the concept, historical background, and recent progress in research of spin current will first be reviewed, and then some topics on advanced materials for the generation and control of spin current will be introduced, particularly focusing on magnetic ordered alloys: half-metallic Heusler alloys as a highly efficient spin injector/detector[2-4] and L10-oredered alloys with high magnetic anisotropy as a perpendicularly polarized spin injector/detector[5,6].

[1] For review, K. Takanashi, Jpn. J. Appl. Phys., 49 (2010) 110001.
[2] T. Iwase et al., "Large interface spin-asymmetry and magnetoresistance in fully epitaxial Co2MnSi/Ag/Co2MnSi current-perpendicular-to-plane magnetoresistive devices", Appl. Phys. Exp., 2, 063003 (2009).
[3] Y. Sakuraba et al., "Mechanism of large magnetoresistance in Co2MnSi/Ag/Co2MnSi devices with current perpendicular to the plane, Phys. Rev. B 82, 094444 (2010).
[4] R. Okura et al., "High-power rf oscillation induced in half-metallic Co2MnSi layer by spin-transfer torque", Appl. Phys. Lett., 99, 052510 (2011).
[5] T. Seki et al., "Giant spin Hall effect in perpendicularly spin-polarized FePt/Au devices" Nature Materials, 7, 125 (2008).
[6] B. Gu et al, "Surface-Assisted Spin Hall Effect in Au Films with Pt Impurities", Phys. Rev. Lett., 105, 216401 (2010).

All interested are cordially welcome!

Organize your personal meeting with the lecturer by contacting M. Kläui

---

Benjamin Krüger
Tel.: 06131/39-23645 Email: bkrueger@uni-mainz.de